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To be or not to be: Belgian science policy in the interwar period

Abstract: During the first decade after the end of the War, the economic situation of the Belgian universities and scientific institutions had greatly deteriorated. Books and equipment had become more expensive, and official budgets had not been able to keep up with rising prices. A professor's salary was relatively small, and it was lamented that only few young people were willing to pursue a career in science. A turning point was reached with the creation of the Belgian Fonds National de Recherche Scientifique in April 1928, after a nationwide fundraising campaign had brought together over 100 million francs in only a few months. The success of the Fonds was largely due to the efforts of Emile Francqui, head of the Société Générale, a holding controlling much of Belgian industry. The role of the Belgian government in the creation of the Fonds was only secondary, if not absent. In this paper we will look at the debates in Belgium with regard to the political support of scientific research, and to what extent an innovative Belgian science policy indeed came into being in the interwar period.

Keywords: belgian science policy; Belgian National Fund for Scientific Research; scientific culture in the interwar period

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In his study of the historical development of Dutch science policy, Frits Henry Brookman made a useful distinction between several definitions of science policy, relevant to the study of its historical development[1]. Science policy could range from the promotion of scientific education and the instrumentalisation of scientific knowledge for politics ('science for policy') to the use of scientific research in making or implementing political decisions ('science in policy'); from the adherence to scientific principles in framing general policies or the legitimation of political regimes ('political scientism') to the moral and financial support of scientific research, either for the benefit of government policies or in the general interest of civilization ('policy for science'). All of these definitions apply to the interaction of scientific and political elites, but in particular since World War I the term 'science policy' has been increasingly used to denote the political support and management of scientific research, and the integration of science in the attainment of political goals, in particular with respect to economic and industrial growth. Underlying this definition is the notion that science is a crucial precondition for industrial development, that the promotion of science can and will make a substantial contribution to economic growth, and that the support of science is a moral obligation for the state.

In this paper we will study the creation of the Belgian National Fund for Scientific Research, often considered as the starting point of Belgian science policy. Its main goal was the support of scientific research as a means to strengthen the industrial basis of the nation. A closer analysis of some of the contemporary debates will reveal, however, that the objectives of the National Fund were less innovative than is usually accepted. In particular, although industrial and financial circles were heavily involved in the creation of the National Fund, the results did not yield many benefits for Belgian industry. The creation of the National Fund was more of a return to a prewar period of scientific elitism, than it was the beginning of a new era of science-based innovation.

In the analysis of science policy, it has become a habit to comment critically on the so-called 'linear model of innovation'. This model implies that basic science is the fundamental source of innovation, and that the process of innovation flows from pure to applied research, and hence to product development and dissemination. The alleged origin of this model is found in Vannevar Bush's famous pamphlet *Science: The Endless Frontier* (1945), in which he warned U.S. government that without the political support of basic research technological progress would become

[1] (BROOKMAN, 1979: 224-240 and 256-274).

impossible. As Bush phrased it: "Basic research is the pacemaker of technological progress." Although at first glance, Bush's appeal is a clear formulation of the link between basic science and applied science, David Edgerton has maintained, however, that this cannot be equated with the linear model[2]. To him, the view professed by Bush merely hints at the fact that basic research will lead to an increase in the reservoir of knowledge, but not that it was connected in any more explicit way to the innovation process itself. In particular, Edgerton points out that historians studying science policy should make a distinction between science and research. It cannot be taken for granted that every scientist in the first half of the twentieth century would consider himself to be a researcher, nor that even the goal of academic science would be to make discoveries. Of course, a scientist could be expected to give expert advice, but to many contemporary observers, there was no direct sequential chain from academic science to industrial innovation.

It is good to keep these remarks in mind before analyzing the development of a science policy in Belgium. In public discourse, this science policy was heralded as a major step in the restoration effort of the nation after the war. Science was considered a source of prosperity and industrial development. It was supported by the major industrial and financial groups in the country. Yet, the main target of Belgian science policy before 1940 was merely the support and expansion of academic science, and in the end financial funding was controlled by the universities – not by industry. This was not the result of a misguided or failed policy, but rather the consequence of a non-research view of academic science, as described by Edgerton. As such, it was the continuation of nineteenth century conceptions, although the new science policy of the 1920's did step back from the traditional non-interventionist attitude of Belgian government.

FNRS-FWO

In 2008, the Belgian *Fonds National de Recherche Scientifique* – since 1992 reorganized in two regional institutions in accordance to the linguistic structure of the nation, FWO Vlaanderen en FNRS – celebrated its 80th birthday. Founded in April 1928, the FNRS has been and still is the cornerstone of Belgian science policy. In 2010, FWO-Vlaanderen could spend 190 million euro on scientific research

[2] (EDGERTON, 2004). See also (GODIN, 2006).

activities and its Francophone counterpart FNRS 160 million. In comparison, in 2008 federal spending on science policy, including the cost of federal scientific institutions and international programs was just under 600 million euro, but only 100 million of this was given to scientific research. After World War II, a second Fund for Applied Research was created, which today in Flanders alone can distribute some 300 million euro on R&D to universities and industry. For basic research, however, the FNRS-FWO remains the most important source of funding.

Given the central role of FNRS, it is amazing that there are very few historical studies of available. In 1978, on the occasion of the 50th anniversary, a small volume with original historical papers was published, which still form the basis of our current scholarship[3]. More recently, Kenneth Bertrams has reviewed the early history of the FNRS in the context of his analysis of science-industry relations in Belgium[4]. In 2008 Robert Halleux and Geneviève Xhayet published the official anniversary volume of the FNRS, which will serve as point of reference for future historical research[5]. The narratives presented in these publications are to some extent quite similar: the FNRS was created as an immediate consequence of a well-received speech given by King Albert I in 1927; it was funded by the main industrial companies and banks (as well as many individual donators); and it was directed towards the promotion of fundamental research, mainly to the benefit of the universities. These conclusions bring out the main players, constituting a truly triple helix: government, industry and universities. The successful creation of the FNRS was the outcome of a salutary alignment of these three players, but also raises questions on how this alignment was forged. Already in the early years of the FNRS it became clear that the scientific research funded by the FNRS would not be of much direct benefit to Belgian industry. Furthermore, the Belgian government remained singularly aloof of any intervention in the work of the FNRS. The Belgian State only became involved after World War II. What were the guiding lines of Belgian science policy in the interwar period and how did they relate to the history of FNRS? Finally, it is not entirely clear what the effect of the FNRS funding was on universities. Did it affect the creation of new scientific disciplines? Did it foster international collaboration? How did it influence the career of young scientists?

[3] (*F.N.R.S. 1928-1978:* 1978).
[4] (BERTRAMS, 2006). See also (BERTRAMS, 2007b).
[5] (HALLEUX and Xhayet, 2007).

This paper will raise more questions than it can provide answers. It will try to bring out the different perceptions of the parties involved in the early history of FNRS. In particular, we will attempt to put the creation of FNRS in the perspective of scientific culture in Belgium during the interwar period.

The royal initiative

There are two main interpretations on the background forces leading to the creation of the FNRS. The 'royalist' interpretation is given by Halleux and Xhayet, and widely referred to in the secondary literature. This interpretation emphasizes the crucial role of King Albert I (1875-1934), not only in delivering his famous speech in 1927, which had an almost instantaneous impact on hundreds of donators, but also in offering a constant legitimation for scientists and industrialists promoting the support of scientific research. Kenneth Bertram has proposed, following the lead of Liliane Ranieri[6], a second interpretation in which the frame of reference is shifted towards Emile Francqui (1863-1935), a powerful figure in Belgian financial and industrial circles. Both interpretations are not incompatible with each other: there were many close links between the two men. But the narratives constructed around the two interpretations bring different questions to the foreground and hides others from view. A confrontation of both interpretations will make this clear.

On 1 October 1927, King Albert addressed a large audience of industrial and political leaders in Seraing, on the occasion of the 110th anniversary of the Usines Cockerill, the leading metallurgical company in Belgium. During the war, the factory had been closed and dismantled by the German regime, but it had recovered remarkably well since then. The King honored its founder John Cockerill, and the people who had surrounded or succeeded him, in particular engineers, workers and industrialists. Then, suddenly, he changed the theme of his discourse: from lauding the intelligence and energy of the earlier generations, he turned towards the present day challenges of industry.

"It is in the research laboratories that the rudiments of future industries are worked out, and yet, one cannot but feel troubled when looking at the poor means which our men of science have at their disposal today. In Belgium, there is a true crisis of scientific institutions and laboratories, and the economic problems caused

[6] (RANIERI, 1978).

by the war and after the war have made it impossible for public authorities to take by themselves the decisive and radical measures which are necessary to remedy this evil. The public in our country does not understand enough that pure science is the indispensable condition for applied science, and that the future of nations who neglect science and scientists is marked by decadence. [...] I am convinced that the industrial elite who is listening to me, will perfectly understand. I ask all of those who form this elite, to think of our universities, our engineering schools, our laboratories. The field is wide open in this domain for private initiative. Inspired by some well-known examples but less frequently adopted in Belgium than in some foreign countries, we must all together find the practical means to promote science and to encourage the researchers and scholars."[7]

The reaction was overwhelming. The discourse was published in its entirety in several newspapers, and the reasons for the bad state of Belgian science were discussed from various ideological points of view[8]. On the 26th November, the King held a second speech at the National Academy, repeating his plea for the support of science: "Science is a source of prosperity, but she herself is poor". At the same time he announced a project for the creation of a National Fund for Scientific Research, and a propaganda committee was set up to collect the necessary funds. The Solvay family donated 25 million francs and within the following months a total of 112 million francs was brought together. The list of donators consisted of some 1,200 names, from large companies and banks, to local societies and individual citizens. The statutes of the FNRS were officially adopted on 27 April 1928 and the Royal Decree was published on 2 June.

This sequence of events suggests a strong driving impulse from the King. Indeed, King Albert, who had studied at the Military School, held a keen interest in science and technology[9]. His friendship with Albert Einstein, who was a frequent guest at the Royal Palace, is only one example of his general enthusiasm for scientific progress. Historians agree that King Albert did write his own speeches, undoubtedly after long deliberations with his entourage. His edification of science as a source of prosperity was not new, nor was it very original. Albert considered science an important element of Belgium's colonial "mission of civilization" in Congo, for which a wide network of laboratories was set up. He also considered science a domain of

[7] The text of the discourse can be found in many places, e.g. (HALLEUX et al., 2001).
[8] (HALLEUX and Xhayet: 2007: 31-34).
[9] (WILLEQUET, 1978); (QUINTYN and Provoost, 1976).

union and concord, an element of peace, with a high moral value. But the connection between pure science and applied science, as proclaimed in his 1927 address, was a less familiar theme. Yet, what exactly he had in mind, is difficult to reconstruct. Nobody would deny, of course, that science was important to modern industrial progress, but exactly how academic laboratories and pure science were related to industrial research and product development was less clear. Apparently, the laboratories played a central role in this, as they were singled out by King Albert among the scientific institutions as sites of research. Furthermore, according to the King, the connection between science and industry had to be made by private initiative, both because the State did not possess the means to do so, but also because this was in line with what happened in other countries. Albert does not explicitly mention any of these examples. He may have been referring to the French *Office National des recherches scientifiques et industrielles et des inventions* (founded in 1922), the English *Department of Scientific and Industrial Research* (1916), the *National Research Fund* (1925) in the United States, or the Italian *Consiglio Nazionale delle Ricerche* (1923). Or he may have been thinking of contract research between individual companies and academic institutions. Quite probably, Albert was not hinting at a direct connection: he pleaded for the support of pure science in the interest of industry – without specifying how the interest of industry could be served by pure science. In a letter to Francqui, shortly after his Seraing Address, he stipulated: "Some people, in particular the press, thought that it was my idea to create new laboratories or practical organizations of an industrial or professional nature; while in fact, one should encourage pure scientific research, which is in the interest of industry itself, as is shown by examples in the most advanced countries."[10] For Albert, his general confidence in the benefits brought by science seemed to be enough to legitimate the creation of Fund for financial support.

The support of academic science

The debate on the support of science and industry did not originate with the Seraing Address. On the contrary, since the end of the war there had been an continuous debate on science, industry and educations. In general politicians were quite convinced of the importance of science for the redress of the nation, and the

[10] Quoted in (RANIERI, 1978: 34-35).

universities installed new education programs for applied sciences. The atmosphere was optimistic and the 'German model' of a science-based industry was taken as an example, notwithstanding the anti-German climate in the aftermath of the war[11]. But despite the patriotic enthusiasm for the support of science and the need to develop Belgian industry in the rebuilding of the nation, the dominant form of connection between academic science and industry in Belgium was at the time limited to personal contacts, mainly between the engineering schools (attached to the universities) and industrial companies. In the years after the war, when infrastructure was still difficult to come by for companies, some voices proposed to open university laboratories for industrial research, which would provide the universities with extra income and would not make it necessary for industries to build their own expensive facilities. But for various reasons, these initiatives were not realized, mainly as a result of the opposition of university boards. The universities held on to their academic mission of educating students in the proper ways of scientific thought. Bertrams explains this reaction of the universities by pointing out that the need for applied scientific research was more felt within industrial circles than the desire among academics to gain industrial support for the university[12]. There was even an outspoken fear that scientific research would come under the influence of billionaires, as it was reported to be already the case in the United States (*Annales Parlementaires*, 18 June 1930). Belgian universities did not turn to industry for extra income. State support was a more reliable source of funding, and better in line with the traditional conception of the university mission. The annual subsidies allotted to the two State Universities (Ghent and Liège), tripled from 1920 to 1928, reaching a total of 39 million francs in 1930, not including special costs for the building or installation of laboratories, etc. Also the two private universities (Leuven and Brussels) received annual state subsidies of 10 million francs each.

If read attentively, King Albert's speech was not a blueprint for a new science policy. Although the outcome of his speech – the creation of the FNRS – may be seen as the start of a new phase in the organization of Belgian research, this was probably not in his original intentions. But his words provided the legitimation for a pro-science movement, which was in the making for many years. Others immediately seized upon the momentum created by the royal speech and in a short time created a completely new organization. The central figure was Emile Francqui, together with a group of like-minded industrialists, scientists and administrators.

[11] (ONGHENA, 2011).
[12] (BERTRAMS, 2006: 197).

The career of Emile Francqui is quite unusual. He was an utterly self-made man, and difficult to assign a place in the cultural landscape of Belgium. Born in Brussels, he entered the Military School at the age of fourteen, where he would later serve as an instructor to the future King Albert I. Twice he was sent on an expedition to Congo, which brought him to the attention of King Leopold II. This lead him to enter a business career, contributing to the industrial and commercial expansion of Belgium in the world. For several years he worked in China, where he met the American engineer Herbert Hoover, the future president of the United States. Back in Belgium Francqui became a member of the board of the *Banque d'Outremer*, and in 1912 also of the *Société Générale*, the most important financial holding controlling much of Belgian industry. During the war Francqui became involved in the securing of food provisions for the Belgian people during the occupation. As the leader of the *Comité National de Secours et d'Alimentation*, he collaborated again with Herbert Hoover, who was president of the *Commission for Relief in Belgium*. Their collaboration was very successful, and already during the war it became clear that some large financial reserves were being assembled. There seems to have been some reluctance to hand over this money to the Belgian government – after all, some of the money had been paid by the government, but some of the money was the result of donations from other sources. As early as 1916, Francqui consulted with university representatives on the possibilities to use the money for the support of Belgian universities. No conclusion was reached, but from then on the support of science was on the agenda. After the war, Francqui cleverly induced Hoover to donate 150 million francs to the Belgian state, with the explicit mention to spend it on the redress of the Belgian universities and on the creation of a University Foundation (inaugurated in 1922) for the coordination of scientific research, the financing of scientific publications and the awarding of travel grants[13].

The reasons for this support of academic science are not clear, and they went not without controversy. The socialist politician Georges Hubin (1863-1947) held that in order to rebuild the devastated country it was absolutely necessary that the true scientific method would be applied to the production processes. He acknowledged that the science taught at the universities was adapted to the level of industrial development. "Yet, it can be said that between the scientific education as it is understood at the universities, and the industrial practice, there is an empty space, a dissolved continuity. [...] We have to recognize that it is not enough that science

[13] (BERTRAMS, 2010).

is taught in various universities. We need a scientific and industrial atmosphere – I emphasize this two associated words – to grow in a special institution. The Germans have grasped this idea very well. They had, even more than we, universities built on the classical structure, but this has not impeded them from establishing higher institutes for industrial science, that have contributed for a very important part to the development of their industries." (*Annales Parlementaires,* 11 September 1919). Hubin indeed proposed to use the millions of Hoover for the creation of an institute for applied sciences, where laboratories would be at the disposal of any researcher with a good idea and a concrete research proposal. Science would not simply be applied to industrial processes; there would also be an important contribution of industrial ingenuity to science education. But Hubin's ideas were not widely shared. In fact, during the interwar years, criticism of the science education system in Belgium with regard to its relation with industry was almost non-existent. The need for intermediate institutes or laboratories was not put on the agenda. Furthermore, not everyone was convinced of the possibility of scientists to work within an industrial context. A political initiative, the creation of a *Conseil National Belge de Recherches* did not materialize. The Belgian Prime Minister Léon Delacroix observed:

> "To state it clearly, I have no absolute faith in the really useful effects to be expected from any official collaboration of a great number of scientists, industrialists and technical administrators, who, subdivided along the major branches of science, would have it as their mission to investigate the problems in the laboratories built and maintained on the expense of the State, and to inform and consult, after they have reached results, our industrialists about the progress to be made in their factories in all aspects: tools, working methods, choice of basic resources, etc."[14]

The orientation given by Francqui to science policy was not directed towards applied or industrial science, but to the reinforcement of the existing university structure. This squared very well with the after war preoccupation of the Belgian government and Belgian public opinion concerning the restoration of Belgian society and culture[15]. It became a commonplace in the annual debates on the budget of the Ministry of Science and Arts to lament the difficult situation of the universities. In 1927, the Catholic Senator Georges Rutten (1875-1952) observed that the price

[14] (BERTRAMS, 2007: 51-75).
[15] (LEMOINE, 1927).

of books and instruments had increased 10 times since 1914, while the financial resources of the State universities had only been raised by a factor 2,5. Consequently, "our universities and scientific societies find it impossible to place the necessary means at the disposal of their researchers."(*Annales Parlementaires. Sénat.* 10 May 1927). The value of academic science was beyond dispute. Science regarded as a necessary element of culture, unity and *social* progress. Its contribution to applied science and industry was only implicitly hinted at and probably taken for granted without further ado.

To increase the basin of knowledge

The idea of a "linear model" cannot be found in Belgian political circles in this period. But also the views of industrialists, who called for industry-related scientific research, did not see a direct link from pure to applied science. A report, prepared by the *Comité national de chimie* in 1927 dismissed the creation of special laboratories as a means to further industrial applications, but pleaded for the use of university laboratories for industrial research. Although the director of a university laboratory remained free at all times to direct the researches within his own institution, an industrialist might negotiate with him to perform scientific investigations that were not possible in his own industrial facilities. Of 44 laboratories questioned by the *Comité national*, 32 agreed to such a scheme. This report, which prefigured the work of the FNRS, did not make mention of new facilities or a reorientation of the nature of research towards industrial applications. The projected organization reinforced once more the existing situation of university laboratories, by enlarging their scope of action into industrial research, but without losing in any way the autonomy of academic research. Moreover, the type of research envisaged in the report seemed to hint more at a form of expert consultancy than at innovative research.

A more detailed account of how university laboratories were to work with industry, was given by Jean Willems, the first director of the FNRS. He saw three possible scenarios. "The first is one in which an industrial company on its own decides to call on the FNRS for tests or research of direct use for the improvement of its products. These works would of course lead to a patent in property of the company. In this case the support of the FNRS would not be justified" as the company would only be pursuing good management practices. Willems continued: "Second case: a group of industrial companies wants to carry out scientific research, of which the results would have immediate or long term industrial applications." In this case,

the FNRS, in which the best qualified representatives of Belgian science are to be brought together, could give advice as to how this particular research could best be set up. "Finally, the third case concerns research with obvious general interest. These problems are very broad and do not interest only one or other group of industrialists, but industry as a whole. The FNRS should study these problems, investigate how a plan of research could be drawn and which means are the most suited. Undoubtedly, in this case, we will see the creation of mixed study groups, bringing together men of science and representatives of the principal industries involved."[16]

In Willems' view, the FRNS would act as a scientific body to organize collaborative research between academic scientists and industry, but only for matters of broad, general interest. The initiative of the research would come from industry, but the benefits for industry were only vaguely defined. In cases where product improvements or patents were involved, Willems did not see a large role for the FNRS. Academic science would be at the service of industry if called upon, but did not have to adapt to industrial demands.

The actual organization of the FNRS was clearly set up to promote academic research. It was not integrated into the system of state laboratories which had developed since the late nineteenth century[17]. Its general mission was to "promote scientific research in Belgium", by "liberating the researcher of material worries, by helping him in the furthering of his career and to stimulate scientific vocations." The FRNS would pay young researchers at the beginning of their career and finance research projects and scientific voyages. Also it would contribute to the purchase of laboratory instruments, and it could finance by its own initiative certain large projects. Finally, the FRNS would serve as the interlocutor of the scientific community with regard to the general state of research in Belgium. It was explicitly stated that the FRNS would not take the place of the universities, nor that it would act as a parallel research institute. It did not possess its own laboratories or research facilities, so that the funding in effect went to the existing research institutes, mainly at the universities. The FNRS was not to be limited to the natural sciences; also research projects in the humanities and social sciences were taken in consideration. During the first ten years, 30% of all researchers (168) appointed as *aspirant* of the FNRS came from the humanities, compared to 36% from exact sciences, 17% from medical sciences

[16] (HALLEUX and Xhayet, 2007: 82-83).
[17] (DISER, 2011).

and only 16% from applied sciences (including agriculture and economics)[18]. One cannot but conclude that the universities were the main beneficiaries of the FNRS. They were also largely represented within its boards and committees[19].

So what happened to the often announced collaboration between academic science and industry? After all, the financial resources of the FNRS were mainly brought together by bankers and industrialists, and they had legitimate expectations that the new organization would yield economic results. Very soon after the creation of the FNRS, a huge controversy was raised on the very first scientific project funded by the FNRS: a scientific mission to Syria to inquiry into the opportunities for archeological excavations. To some, the choice of this project marked the indifference of the FNRS towards the needs of Belgian industry[20]. The organization of the FNRS provided two opportunities for industry to have an impact on the direction of research. On the one hand, industrialists could become member of the Administrative Board or the scientific committees of the FNRS, but very few did. Bertrams has calculated that from 1928 until 1963, a mere 9.3% of all administrators were appointed in their quality as industrialist[21]. As before, the collaboration between science and industry depended on the willingness of individual scientists to enter into a project with industry. The second opportunity was the creation of a separate body within the FNRS, the *Commission mixte Science-Industrie*, instituted in July 1929[22]. The Commission indeed fully answered the expectations created before the foundation of the FNRS, but its importance within the organization was small. On average only 17% of total expenses were bestowed on industrial projects. Even more telling is the amount of subsidies demanded and obtained by academic and industrial projects. Whereas the industrial projects submitted on average amounted to about three quarters of the subsidies demanded by academic projects (in several years the industrial demands even exceeded the academic projects), the actual funding for industrial projects was only one fifth of the academic projects. These numbers did not cause the FNRS to review its policy. Even during the economic crisis of the mid-1930's, scientific collaboration with industry was not particularly stimulated. A cynical interpretation might suggest that the Commission was actually created to separate academic projects from the influence of industrial debates. The FNRS

[18] (HALLEUX and Xhayet, 2007: 59).
[19] (BALTHAZAR, 1978).
[20] (BEGHIN, 1939: vii).
[21] (BERTRAMS, 2006: 223).
[22] (BEGHIN, 1939).

remained a strictly university organization and the critical voices from industrialists would continue being heard.

Science policy and the scientific researcher

Did the foundation of the FNRS bring about a new phase in the history of science policy in Belgium? Halleux and Xhayet maintain that it did anticipate a science policy to come[23]. The FNRS assumed several new roles in the scientific landscape. It acted as an 'observatory of science', collecting information on scientific research and advising the government on policy issues concerning e.g. the career of young researchers. The FNRS also represented Belgian science on the international scene, e.g. by participating in the international polar year of 1932. But none of these functions were actually new. In the nineteenth century, similar functions were fulfilled by the Royal Academy for Science, Letters and Arts and to some extent they still were at the time. The main difference between the FNRS and the Academy was the large financial support the FNRS was able to give, whereas the Academy only served as a forum for scientific debate and public representation. In general, the scientific climate in Belgium in the immediate aftermath of World War I was much related to the pre-war optimistic beliefs in science and technology, of which it continued the general approach to science policy[24].

The real innovation of the FNRS, however, was the creation of the paid scientific researcher, and with it the emergence of the universities as research centers[25]. Young students were now in a position to start a scientific career by doing paid research in attendance of an official nomination at a university. Professors learned how to formulate short term research projects and to apply for financial support. The universities were indeed quick to make use of the new resources offered by the FNRS. Although the FNRS in its early history did not change the nature of academic research, and certainly was not the expression of any linear model of innovation, it did bring into existence a scientific community that was reared on a system of subsidies and short term projects – a system which after the Second World War would grow into a modern science policy.

[23] (HALLEUX and Xhayet, 2007: 59-63).
[24] (ONGHENA, 2011: 300).
[25] (BERTRAMS, 2007a: 71-72).

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